

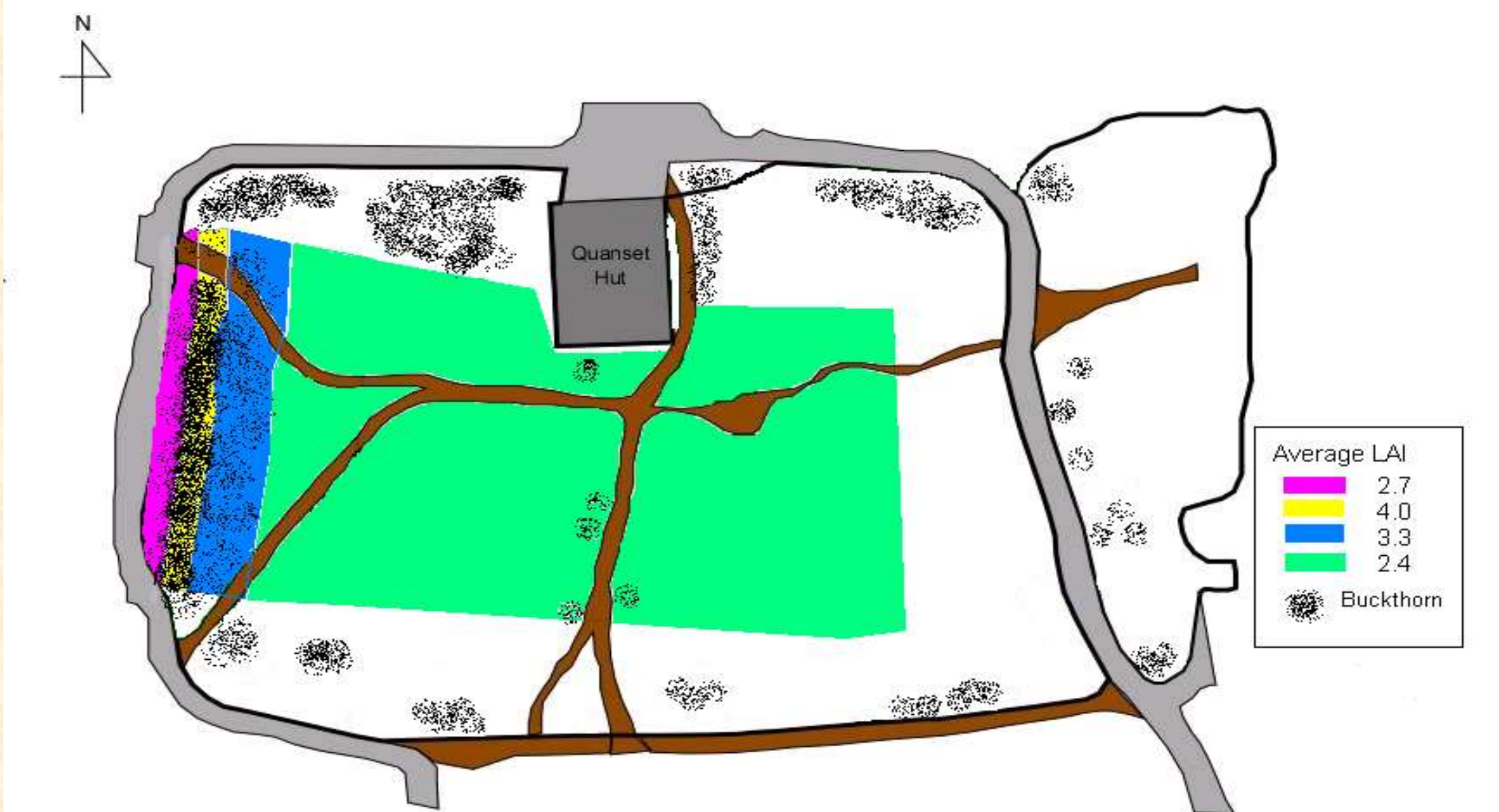
Light Characteristics of an Urban Forest Canopy

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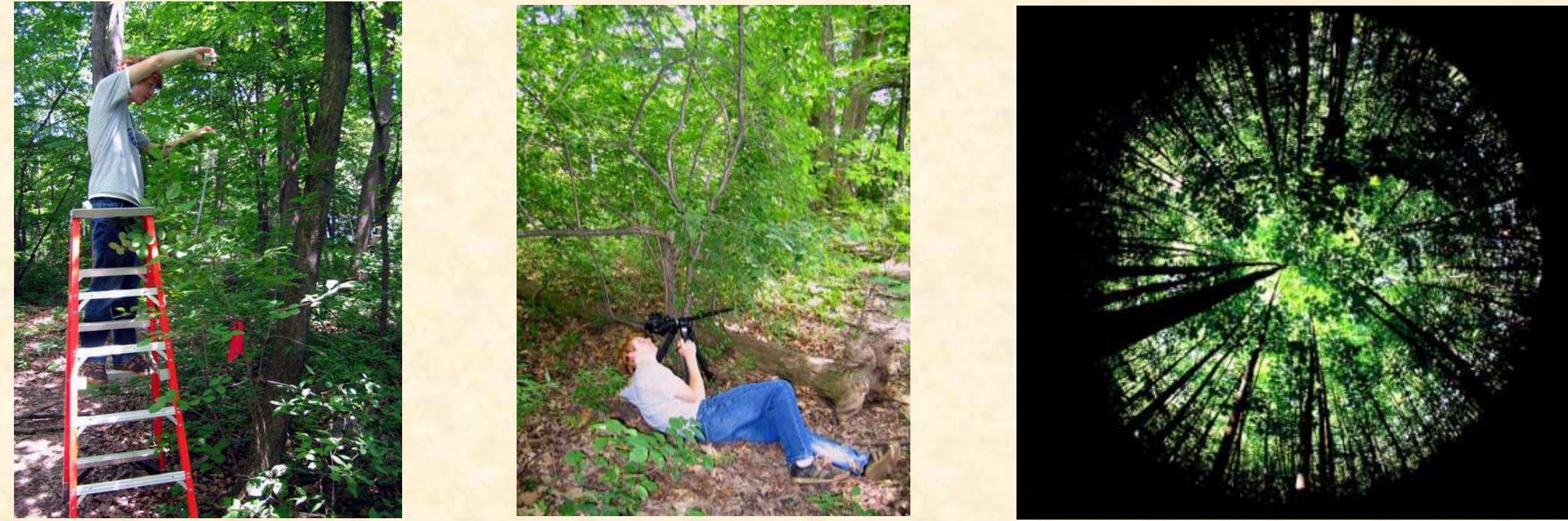
Objectives

- Characterize the quantities of photosynthetically active radiation (PAR) penetrating a mature urban forest canopy
- Compare physical attributes of native and invasive plant species in an urban forest to inform a restoration plan
- Compare LAI's (leaf area indices) and light intensities in several plant communities
- Initiate a restoration study and start documenting changes in the light regime of a forest canopy that is undergoing restoration

Light Profile



Species-Specific Comparisons



Species	LAIc	Leaf Area (cm ²)	Volume (m ³)	Leaf Area per Acre
Sugar Maple	1.18	15684	1.3	6517
Glossy Buckthorn	1.16	8476	3.6	11059
Common Buckthorn	1.11	17108	41	12188
Highbush Cranberry	0.94	5832	1.2	5146
Redbud	0.8	7190	0.7	4092
Bladdernut	0.75	12949	2.2	8765
Ash	0.59	4090	0.8	5407

No significant differences were found among plant species in the Fieldhouse woodlot for either effective LAI and actual leaf area

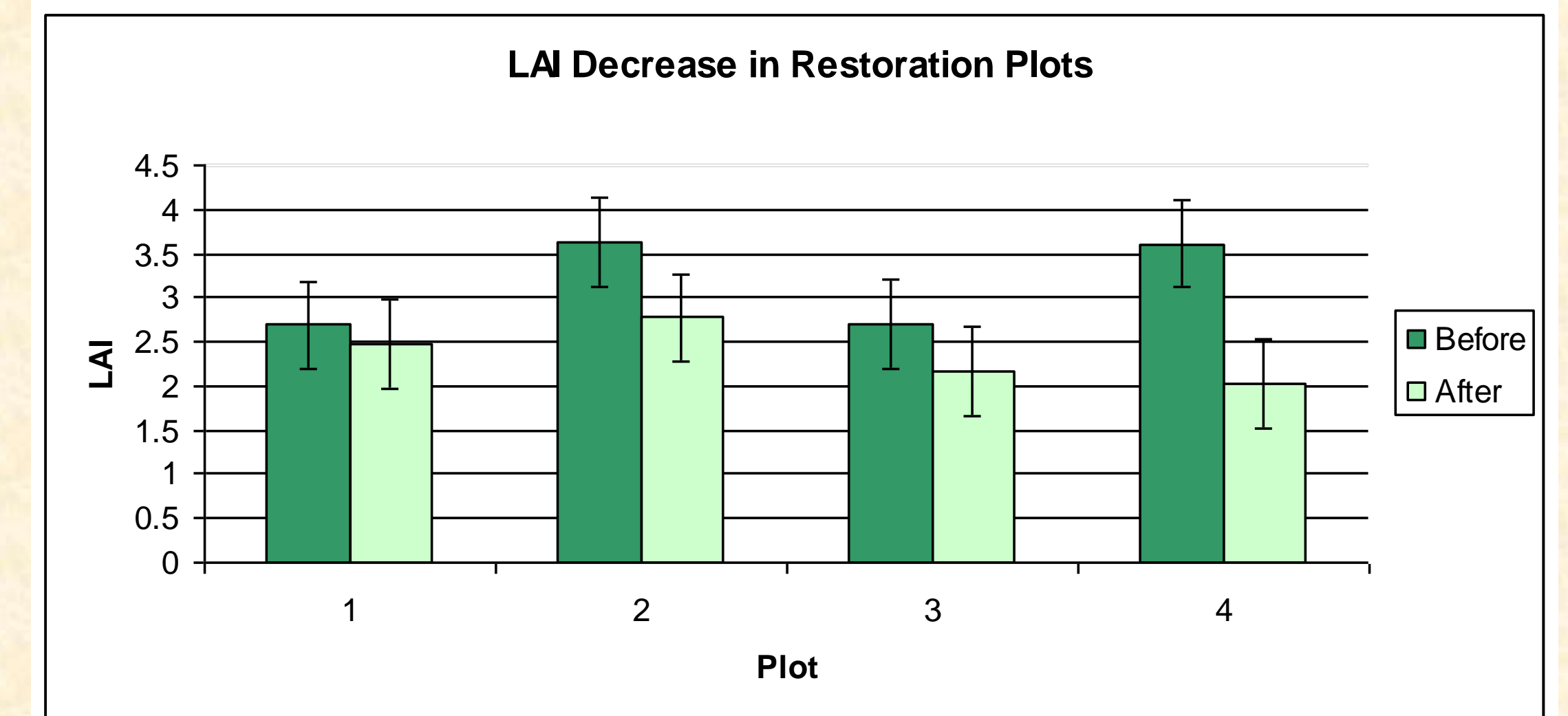
Plant Canopy Comparisons

Species or Community	LAI		Canopy Openness	Light
	4	5		
Gray Dogwood	4.6	3.7	5.9	7.04
Sugar Maple	3.2	2.8	8.6	6.65
Hawthorn	2.9	2.4	11.7	30.8
Common Buckthorn				
Glossy Buckthorn				
Fieldhouse Woodlot	2.4	2.1	15.5	35.9
Young Growth Forest Preserve	2.3	2.0	16.0	7.81
Old Growth Forest Preserve	2.2	1.9	17.1	6.97
LSD _{0.05}	0.6	0.5	3.8	--

- Plant communities exhibited significant differences among their LAI's
- Buckthorn was only present underneath the hawthorn stand, yet sites with lower LAI's seemed to restrain buckthorn establishment



Restoration Project



Before

After



Buckthorn removal decreased LAI's significantly in all four plots, despite the initial differences in forest structure between the sites

Conclusions

- *Rhamnus cathartica* (Common Buckthorn) and *Rhamnus frangula* (Glossy Buckthorn) absorb significant quantities of PAR on the forest edge (1-6 m in from the drip-line)
- *R. cathartica* and *R. frangula* add significantly to the LAI of the forest edge, but not to the forest interior
- By asserting itself on the western edge, buckthorn seems to take advantage of the high PAR levels in late afternoon and evening, transmitting little PAR to under story plant species

- LAI is a valuable measure of the dynamic light regime in a plant community, characterizing the quantity of light (PAR) available for photosynthesis
- While buckthorn seems to thrive in areas with low LAI, presumably by growing rapidly in response to high levels of available PAR, it does not completely explain why buckthorn may become established in one plant community and not another
- When established, buckthorn stands quench much of the available PAR, producing a high LAI that could inhibit the health and survival of under story plant species
- Future studies could consider the effect of light quality on the establishment of buckthorn in mid- and under-stories of a forest, or whether buckthorn changes light quality to gain competitive advantage